



UNITED STATES PATENT AND TRADEMARK OFFICE

cl
UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/805,044	03/19/2004	Hee Tae Jung	4240-104	9621

23448 7590 12/19/2006
INTELLECTUAL PROPERTY / TECHNOLOGY LAW
PO BOX 14329
RESEARCH TRIANGLE PARK, NC 27709

EXAMINER
GROSS, CHRISTOPHER M

ART UNIT	PAPER NUMBER
1639	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	12/19/2006	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/805,044

Applicant(s)

JUNG ET AL

Examiner

Christopher M. Gross

Art Unit

1639

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 November 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-31 is/are pending in the application.
- 4a) Of the above claim(s) 1-6, 12, 14-21, 27 and 29 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 7-11, 13, 22-26, 28, 30 and 31 is/are rejected.
- 7) ☒ Claim(s) 7-11, 13, 22-26 and 28 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/19/2009

- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____

DETAILED ACTION

Responsive to communications entered 11/13/2006. Claims 1-31 are pending. Claims 1-6, 12,14,15-23,27,29 are withdrawn from consideration. Claims 7-11,13,22-26 and 28,30 and 31 are examined herein.

Priority

Acknowledgment is made of applicant's claim for foreign priority under 35 U.S.C. 119(a)-(d) to Korean patents 10-2003-0051140 filed 07/24/2003 and 10-2003-0051826 filed 07/26/2003. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Election/Restrictions

Applicant's election without traverse of group III (claims 8-14 and 23-29) and the species: "protein" from claims 11 and 26; "H₂N-R₁-NH₂" wherein R₁ is C₁-C₂₀ saturated hydrocarbon reading on claims 8-11,13,23-26 and 28 in the reply filed on 11/13/2006 is acknowledged.

In the restriction requirement mailed 10/13/2006, the distinction between groups II and III was based inadvertently on the invention groups being drawn to related products. It is noted, however that that group III (claims 8-14 and 23-29) is drawn to a method of preparing a CNT biochip (a process) whereas group II (claims 7, 22,30 and 31) is drawn to a high density CNT film (product). In the interest of compact prosecution, groups II and III are hereby rejoined.

Claims 1-6, 12,14,15-23,27,29 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention or species, there being no

Art Unit: 1639

allowable generic or linking claim. Election was made **without** traverse in the reply filed on 11/13/2006.

Abstract

Applicant is reminded of the proper language and format for an abstract of the disclosure.

The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The abstract from the instant case states "by means of an exposed chemical functional group on a surface of a high density CNT film or pattern which is produced by laminating repeatedly carbon nanotubes (CNT) by chemical bond." Appropriate correction is required.

Information Disclosure Statement

The information disclosure statement entered 3/19/2004 is objected to because the patent applications are not listed with the application serial number and filing date [See MPEP 609.01, (B)(1)(e)(iii)]. The Examiner has **not** initialed reference AA for the above reason.

Claim Objections

Claims 7-11, 13, 22-26 and 28 are objected to because they are dependent on claims directed to a non-elected invention. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Appropriate correction is required.

Claim 7 is objected to because the term CNT is abbreviated. Applicant is required to spell out the first instance of an acronym in the claims.

Claim Rejections - 35 USC § 112

The following is a quotation of the **second** paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 7-11,13,22-26 and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Found in each of claims 1 and 15 the term "diamine type organic compounds" is vague and indefinite. The addition of the word "type" to an otherwise definite expression (e.g. diamine) extends the scope of the expression so as to render it indefinite. See *Ex parte Copenhagen*, 109 USPQ 118 (Bd. App. 1955). See also MPEP 2173.05(b). Claims 7-11,13 depend from claim 1 and claims 23-26 and 28 depend from claim 15 and are thus rejected under 35 USC 112 second paragraph.

The figure n used in claims 1 and 15 is indefinite. No upper limit is given for the figure n, and thus may be infinite and thus indefinite. Appropriate correction or clarification is required.

Claim 24 recites the limitation "carboxyl group" in line 2. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 102/103

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the

Art Unit: 1639

applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7-11,13,22-23,25-26 and 28 are rejected under 35 U.S.C. 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over **Rumpf et al** (US Patent Application 2004/0028901).

The claimed invention is drawn to a high density CNT film or pattern which is prepared by the method according to claim 1, and has a carboxyl group exposed on its surface. Claims 8-11,13,22-26 and 28 represent variations thereof.

For **claims 7 and 22 -**, Rumpf et al. disclose, throughout the document and especially the abstract and paragraphs and 0041 and 0045, compositions comprising

aggregates of carbon including nanotubes which are chemically crosslinked to inorganic materials including silica.

Rumpf et al teach in paragraph 0082, silanes, including aminoalkyl silanes may be used for linking said nanotubes to said silica, in paragraph 0128 Rumpf et al teach the use of a patterned surface, in paragraphs 0172 and 0178 Rumpf et al teach linkers to modify the nanotubes to provide carboxyl groups and amides thereon.

The product of Rumpf et al. meet all of the structural limitations of the claimed product (see above) except for the product-by-process limitations (i.e., the method according to claim 1 or 15). See MPEP § 2113, "[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.' *In re Thorpe*, 777 F.2d 695, 698, 227 USPQ 964, 966 (Fed. Cir. 1985)." Here, Applicants' claims are drawn to a high density CNT film (i.e., a product), but are defined by various method steps that produce said film and, as a result, represent product-by-process claims. Thus, the process limitations do not appear to provide any patentable weight to the claimed invention in accordance with MPEP § 2113. If $n=0$, as set forth in claims 1 and 15 step (c), one of ordinary skill would expect the product of Rumpf et al to be the same as that claimed no matter how it was synthesized and/or prepared.

Rumpf et al teach in paragraph 0087, and embodiment comprising proteins (elected species of claim 11), which absent evidence to the contrary have amine groups capable of forming an amide bond with the carboxyl groups on the nanotube mentioned above, therein reading on claims 8-11,25 and 26 (elected species).

Rumpf et al teach in paragraphs 0167-0194 other linkers to modify the nanotubes to provide amines, aldehydes, alcohols, carboxylic acid halides and thiols, as set forth in claims 22 and 23.

Rumpf et al teach in the abstract the aggregates of nanotubes chemically crosslinked to silica, described above, may be used for selective protein binding, which therein reads on detecting a biomolecule with a nanotube bound bio-receptor as set forth in claim 13 and 28.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

Art Unit: 1639

consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 7-11, 22-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Niu et al** (US Patent 6,872,681) in view of **Mamedov et al** (2002 Nature Materials 1:190-194)

Niu et al teach, throughout the document and especially the abstract and column 10, line 61 compositions comprising oxidized nanotubes with carboxylic acid groups as is set forth in claim 7.

Niu et al teach under "Secondary Functionalization of Oxidized Nanotubes" bridging columns 10 and 11, the immobilization of proteins (elected species of claim 11), enzymes, oligonucleotides, etc, which is taken as the bio-receptor set forth in claim 8 and 31.

The proteins of **Niu et al**, absent evidence to the contrary, have amine groups capable of forming an amide bond with the carboxyl groups on the nanotube mentioned above, as set forth in claims 9-11, 22, 23, 25, 26 (elected species) as well as the bio-receptor coupled thereto of claim 31.

Niu et al teach in the table in column 11, dimines such as " $H_2N-R_1-NH_2$ " wherein R_1 is C_1-C_{20} saturated hydrocarbon (elected species) as set forth in claim 24 as well as aldehydes, hydroxyls, thiols and halogens as set forth in claims 22 and 23 for modifying the nanotubes.

Niu et al do not teach n greater than 0 in preparing the nanotube film set forth in claims 1 step (c) and 15 step (c)

Mamedove et al, throughout the document and especially page 191 second paragraph and page 193 first paragraph, a method of preparing nanotube films by sandwiching amide crosslinked carboxylated nanotubes between polyethleneimine (PEI) and poly acrylic acid (PAA) to build up a surface layer by layer and is taken to meet all of the limitations set forth in claim 30.

It would have been *prima facie* obvious for one of ordinary skill in the art, at the time the claimed invention was made to apply the process of building up a nanotube film by sandwiching amide crosslinked carboxylated nanotubes between PEI and PAA per Mamedove et al with the protein derivatized nanotubes of Niu et al.

One of ordinary skill in the art would have been motivated to use the process of building up a nanotube film by sandwiching amide crosslinked carboxylated nanotubes between PEI and PAA per Mamedove et al with the protein derivatized nanotubes of Niu et al because it would prevent mechanical failure and phase separation, as noted by Mamedove et al in the abstract.

One of ordinary skill could use the process of building up a nanotube film by sandwiching carboxylated nanotubes between PEI and PAA per Mamedove et al with the protein derivatized nanotubes of Niu et al. with a reasonable expectation of success since Mamedove et al illustrate in figure 4, improved tensile strength of the PEI/PAA layered nanotubes as compared to a single layer and both references employ carboxylated nanotubes.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Gross whose telephone number is (571)272-4446. The examiner can normally be reached on M-F 9-5:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, J. Douglas Schultz can be reached on 571 272-0763. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Christopher M Gross
Examiner
Art Unit 1639

JON EPPERSON, PH.D.
PATENT EXAMINER

cg